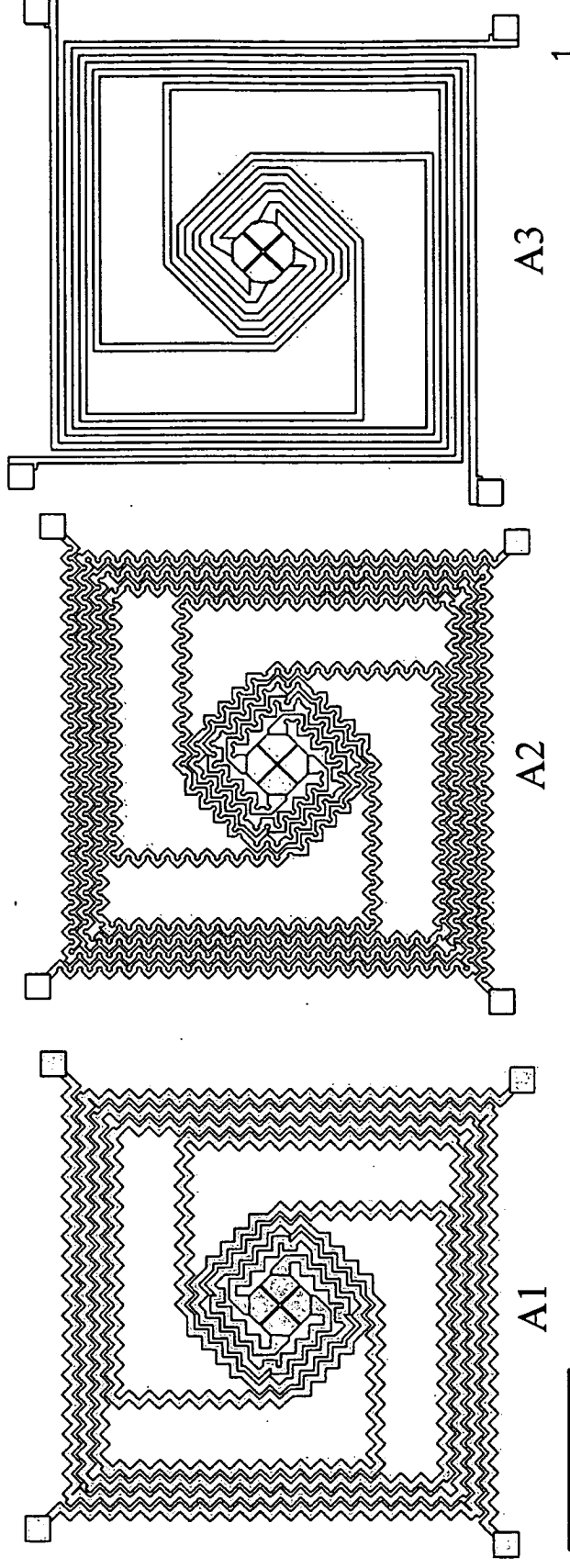


## US patent 6,089,182: Simulation of antenna

- Disclosed embodiments were simulated and compared to illustrate impact of “cut-offs” on inductive performance of antenna
- Commercial industry-proven sw Maxwell v.11 (Ansoft, Inc.) was used to generate results below
  - Same currents (50 Amps) in each antenna branch is used, total current 200 Amps



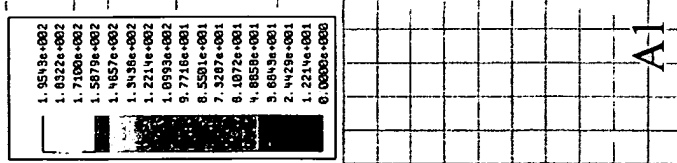
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## US patent 6,089,182: Simulation of antenna

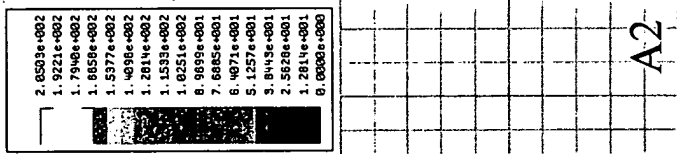
- RF power deposited into uniform plasma domain has very similar distribution for both versions and max values differ ~ 5% which is not significant and in order of numerical simulation error

0 – max linear scale



Without thermal expansion cut-offs  
Max. value of the RF power  
deposited into plasma 195 W/cm<sup>2</sup>

0 – max linear scale



With thermal expansion cut-offs  
Max. value of the RF power  
deposited into plasma 205 W/cm<sup>2</sup>



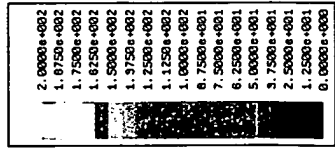
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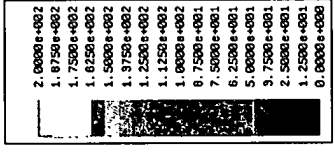
- Distribution of the RF power deposited into uniform plasma domain on the same plot scale

0 – 200 W/cm<sup>2</sup> linear scale



A1

0 – 200 W/cm<sup>2</sup> linear scale



A2

Without thermal expansion cut-offs  
Max. value of the RF power  
deposited into plasma 195 W/cm<sup>2</sup>

With thermal expansion cut-offs  
Max. value of the RF power  
deposited into plasma 205 W/cm<sup>2</sup>

3



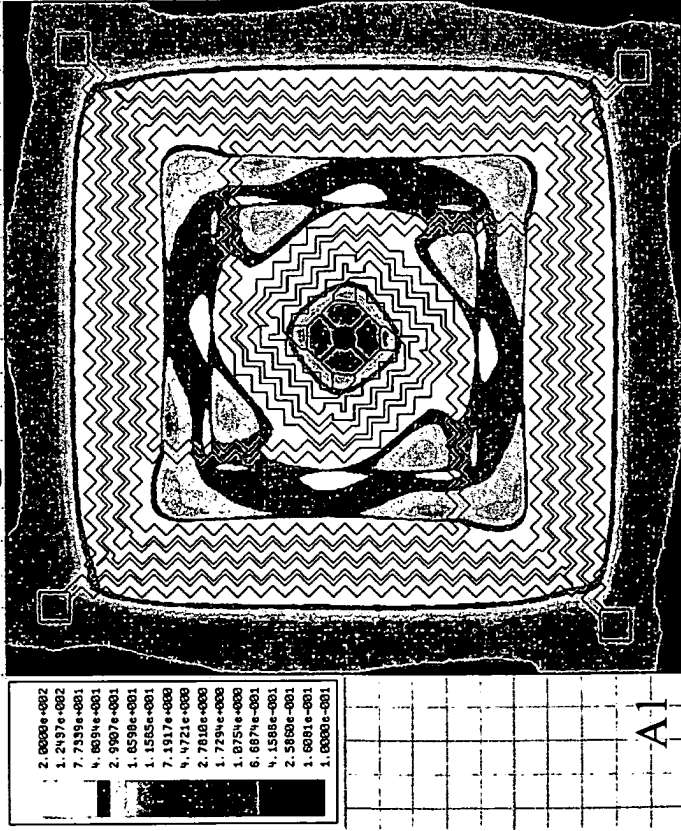
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# US patent 6,089,182: Simulation of antenna

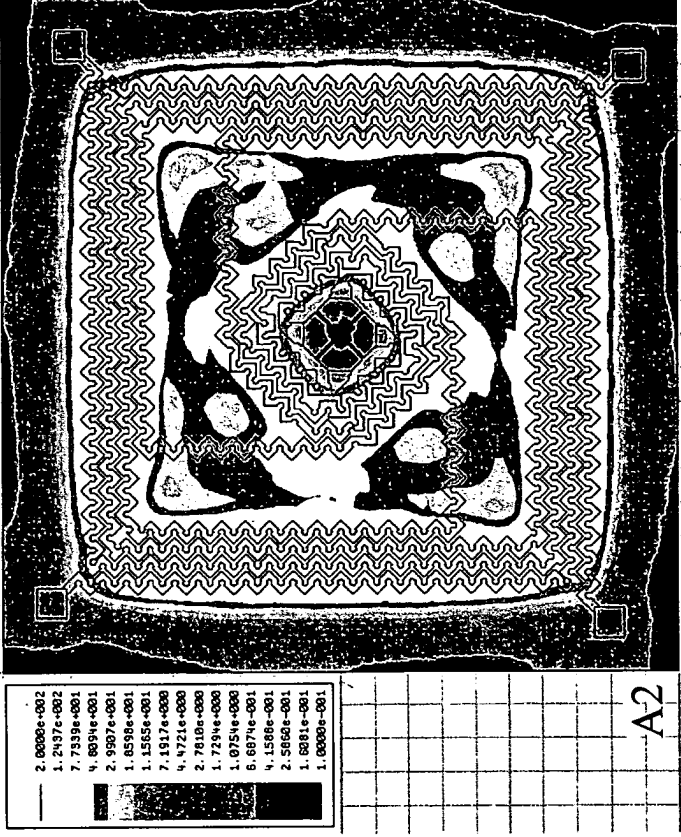
- Distribution of the RF power deposited into uniform plasma domain on the same plot scale

0.1 – 200 W/cm<sup>2</sup> log scale



Without thermal expansion cut-offs  
Max. value of the RF power  
deposited into plasma 195 W/cm<sup>2</sup>

0.1 – 200 W/cm<sup>2</sup> log scale



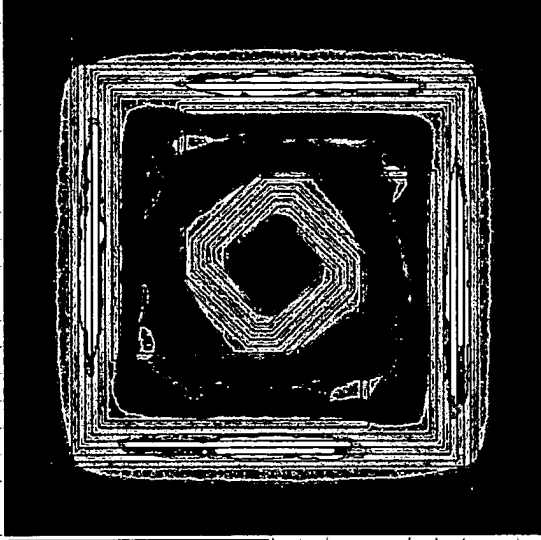
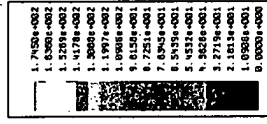
With thermal expansion cut-offs  
Max. value of the RF power  
deposited into plasma 205 W/cm<sup>2</sup>



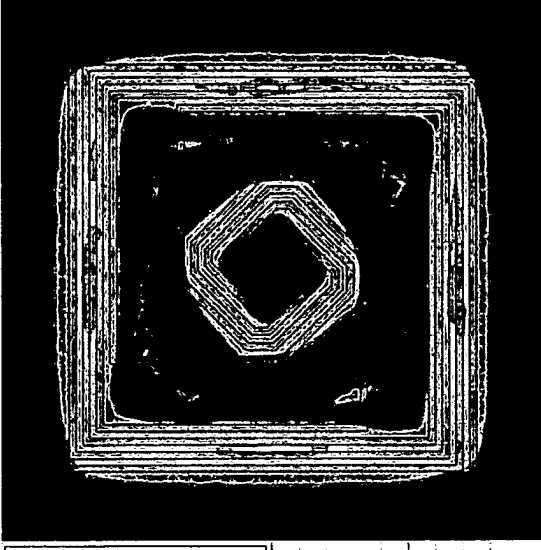
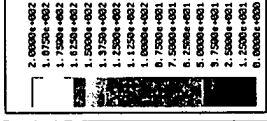
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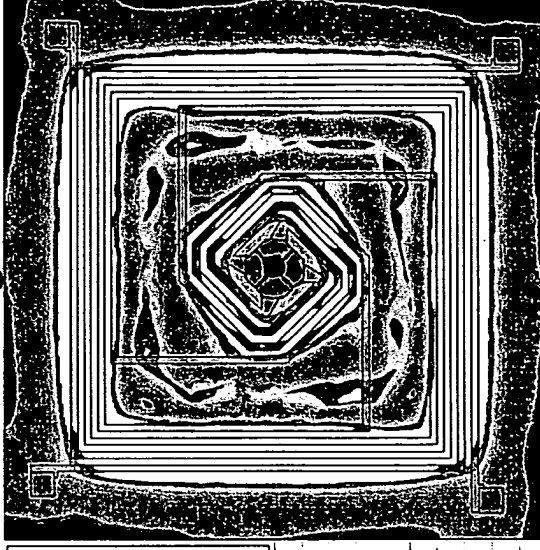
0 – max linear scale



all-A3

0 – 200 W/cm<sup>2</sup> linear scale

## Same size antenna without any features to reduce impact of the thermal expansion

0.1 – 200 W/cm<sup>2</sup> log scale

- RF power distribution is identical to the embodiments on the previous slides
- The range of absolute value can be easily corrected by RF power from supply without affecting the distribution
- Increased current up 7 % will produce distribution identical to embodiments on previous slides



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## US patent 6,089,182: Simulation of antenna

		A1	A2	A3
max power	W/cm <sup>2</sup>	195	205	175
total power	W	88438	86889	67415
Inductance	mH	0.425	0.452	0.405

I <sub>BRANCH</sub>	50 Amps
I <sub>TOTAL</sub>	200 Amps

- Illustrated features in 6,089,182 do not have impact on an antenna electrical performance – RF power distribution
- The cut-offs purpose in 6,089,182 is exclusively to improve a thermal performance of the assembly that includes antenna, thin window and gas throughputs plate all mechanically attached together

